ILVO
Flanders research institute for agriculture, fisheries and food

MSCA postdoc fellowship hosting offers for 2023 call

The Flanders Research Institute for Agriculture, Fisheries and Food (ILVO) is a public research institute located in Belgium. ILVO performs multidisciplinary, innovative and independent research aimed at economically, ecologically and socially sustainable agriculture and fisheries. Through this research, ILVO accumulates fundamental and applied knowledge which is vital for the improvement of products and production methods, for quality control and the safety of end products, and for the amelioration of policy instruments as a foundation for sector development and agricultural policy for rural areas.

Recently, some important management decisions have been made to orientate the research at ILVO in a holistic framework of systems thinking as well as to combine ILVO's tacit knowledge with new technological approaches like genomics, metabolomics, (remote) sensing technology, artificial intelligence, precision farming, innovative food/feed production technology, new breeding technologies, animal models, modelling as well as participatory social sciences approaches. This means that a lot of the research at ILVO is conducted in Living Labs, such as a Food Pilot, fishing vessels, modern greenhouses and animal farming units, and in the context of inter- and transdisciplinary research. To accelerate and further improve this new research process, **ILVO is looking to host young and experienced researchers at post-doc level (max. 8 years of experience) in the framework of Marie Sklodowska-Curie individual fellowships within the new Horizon Europe framework program.**

Possible research items are shown below and are divided over the different research units of ILVO. **Please contact the respective contact persons if you are interested in a specific item or research unit.**

Technology and Food Science Unit

General contact person: Marc Heyndrickx; marc.heyndrickx@ilvo.vlaanderen.be

***Heat transfer and mass transport phenomena in thermal food processing**. They are very important, as they determine the processing time and conditions for optimal food quality and safety. We can establish accurate heat-transfer models based on thermal properties of food and e.g. enzyme kinetics determined in laboratory conditions (using T-t curves). From also a modeling perspective, a spatial and temporal discretization of the heat transfer problem will result in exact time-temperature profiles throughout the food, so that the evolution of food quality and safety parameters during thermal processing can be predicted. CFD (computation

fluid dynamics) software with auxiliary numerical modelling techniques can be used to optimize thermal food processing.

Development and implementation of molecular and mass spectrometric analysis methods for GMO and food allergen testing, *including e.g. ELISA, qPCR (quantitative real-time PCR), ddPCR (droplet digital PCR), LC-MS and MALDI-TOF methods.* Within ILVO's Food Pilot it is possible to prepare allergen-incurred food matrices mimicking real-life food processing. These matrices can be used to study the impact of processing on allergens. This can either be focused on detectability (with ELISA, qPCR (quantitative real-time PCR), ddPCR (droplet digital PCR) or LC-MS or MALDI-TOF), on identifying stable proteotypic peptides or on investigating the modifications induced by this processing. The last two using LC-high resolution mass spectrometry (LC-HRMS).

***Precision crop farming.** As a research institute ILVO cooperates with government, industry, academia, civil participants and of course also with farmers to explore possibilities for innovation and economic added-value by the application of remote-sensing techniques in agriculture and precision application technologies for plant-protection products and fertilizers. In addition, ILVO focusses on integration of data to come to smart solutions that can support farmers in their management. Several national and international projects are currently running within this research field, enabling interested post-doc researchers to perform valuable synergetic activities.

* **Precision livestock farming.** ILVO's precision livestock farming group focuses on (1) development of sensors, algorithms and decision support tools for individual animal monitoring and related research activities, (2) supporting the sector in using these technologies and the information that they provide, (3) innovations together with industry for the digitization of processes such as data exchange. Our current projects include research on automated tools for lameness, claw lesions and health and behaviour monitoring for pigs and cows where we utilize sensors like 3D cameras, thermal cameras and RFID tags. Running innovation projects evolve around API economy, data standards, IoT (internet of things), HPC (high performance computing) and data exchange, for example IoF2020, CYBELE, SmartAgriHubs and DjustConnect. In addition we are involved in projects on farm demonstrations and the support of farmers and advisors in using digital tools. Several national and international projects are currently running within this research field, so we can welcome post-doc researchers with topics that align with these running (and future) projects.

***The fusion of Copernicus data, with in-situ farm measurements and other auxiliary data for the forecasting of livestock methane emissions**. For the modeling process, the postdoc researcher will combine modern techniques of data science (Artificial Intelligence, machine learning, deep learning) with traditional spatial analysis to create robust livestock methane emissions prediction models for both classification and regression tasks. The main questions to be answered are:

- What are the drivers or the factors that affect livestock methane emissions over time?
- What is the relation between spatial structure, farm practices, and methane emissions drivers?
- How can we identify the impact of adjacent or nearby livestock activities on rural areas at different analysis scales?
- How can Earth Observation data, can support Greenhouse Gas (GHG) Emissions management?

- How data sharing practices and Artificial Intelligence (AI) federation may accelerate GHG modeling?

Why at ILVO? ILVO has extended experience in Precision Livestock Farming (PLF) and participates as a core partner in relevant lighthouse EU H2020 projects like IoF2020 and Cybele. ILVO also operates a data-sharing platform that makes use of cloud technology and enables the establishment of connections with various data sources. Additionally at ILVO, the leverage of AI, EO, and cloud technology in the AgriFood sector are daily tasks related to the completion of various research topics in PF and PLF. Moreover the Postdoc researcher will have the full support of motivated and top-level scientists and the opportunity to participate in a highly collaborative environment, that promotes the 2-way transfer of knowledge (between fellow and host and vice versa). Last but not least, the specific research topic is a high priority not only for ILVO but also for the AgriFood industry and the EU.

Useful sources:

https://www.iof2020.eu/
https://www.cybele-project.eu/
https://www.copernicus.eu/en
http://www.fao.org/news/story/en/item/197623/icode/
https://towardsdatascience.com/the-new-dawn-of-ai-federated-learning-8ccd9ed7fc3a
https://atmosphere.copernicus.eu/1st-artificial-intelligence-copernicus-workshop
https://www.atmos-meas-tech.net/12/6771/2019/amt-12-6771-2019.pdf

***Livestock emissions (gases, dust, odour).** ILVO is the reference institute of the Flemish government for the assessment and development of reduction techniques for livestock emissions (gases, dust, odour). Especially of interest are ammonia and greenhouse gas emissions from mechanically (pigs and poultry) and naturally ventilated (dairy & beef cattle) animal housing systems. Our research and collaboration efforts aim to develop innovative and widely applicable monitoring and mitigation techniques (both front- and end-of-pipe). Therefore we study emission and ventilation processes at different scales (lab, test installations, farm) using advanced measuring techniques (e.g. ultrasonic anemometry, FTIR, laser absorption spectrometry, olfactometry) and modelling tools (e.g. mechanistic modelling, Computational Fluid Dynamics). ILVO has a modern test infrastructure, including real life animal houses. Several national and international (H2020) projects are currently running within this research field, enabling interested post-doc researchers to perform valuable synergetic activities.

***Application of Artificial Intelligence in in agrifood sector**

Artificial Intelligence (AI) has revolutionized the way raw data is processed. In the omnipresence of cameras and cheap sensors, large amounts of data are produced which have catalyzed the development of faster and more accurate models. Especially in the domain of image analysis where convolutional neural networks have revolutionized the processing chain.
ILVO is currently investigating several cases where image analysis could provide additional tools for the farmers to reduce their costs and the overall environmental impact. Using high resolution drone imagery, weeds, diseases and plagues are detected and mapped with object detection. Cameras mounted on robots, spraying beams and tractors are investigated in a step towards edge computing and real-time actionable data. Novel approaches are explored in the domain of anomaly detection to reduce the label cost and increase the models' robustness under field circumstances.

In addition, hyperspectral and RGB cameras mounted on conveyor belts provide a continuous stream of data that can be used for supervised object detection or semi-supervised anomaly detection of food products.

***Application of Earth observation techniques in agriculture and livestock**

The European Copernicus program and NASA's missions provide a large amount of free remote sensing data worldwide. Remote images are acquired by optical, radar and other sensor types with a wide range of spatial and spectral resolutions, temporal frequencies and geographical coverages. We are actually witnessing a democratization of the satellite data, and the research institutes like ILVO have the responsibility to transform these row data into useful tools, advices and plans for farmers and policy makers. Earth observation data play a key role in an increasing number of ILVO projects at European and national level, dealing with *i*) soil management and conservation with emphasis on the estimation of the soil organic carbon to support farmers and decision makers in the context of the common agriculture policy; *ii*) crop monitoring and yield estimation including the evaluation of the factors which have direct impact on the productivity, to support farmers in their decisions; *iii*) livestock methane emission monitoring and forecasting by the fusion of Copernicus data with in-situ farm measurements and other auxiliary data. We can welcome post-doc researchers with topics that align with the ongoing and future ILVO projects.

***Functional plant, algal and microbial proteins for healthy, innovative and qualitative food products**

ILVO has a Food Pilot (www.foodpilot.be) which is a unique technological application centre for the food and allied industry, encompassing complete processing lines for meat, juices, dairy, heating (UHT, sterilisation, pasteurisation), drying, dry and wet extrusion, mixing and milling as well as analytical labs for microbiology, (bio)chemistry, physico-chemistry and taste panels. To further expand our expertise in the field of proteins, an up to date processing line for the production and extraction of proteins from different plant-based, algal and microbial sources is available. In combination with the recently installed high-moisture extrusion (HME) unit on our twin-screw extruder, these systems will provide excellent opportunities to perform ground-breaking research in the field of protein extraction and application. At lab scale was also invested in a benchtop high moisture extrusion equipment to mimic extrusion processes on lab scale.

With the increasing interest in the use of different new proteins by the food industry, the lack of basic knowledge regarding the behavior of these proteins in several industrial-scale processes and different food matrices is becoming a bottleneck for further exploitation. The main objectives of the running and envisaged research projects is to increase basic knowledge on the impact of different processing steps (extraction, drying, high moisture extrusion (HME)) on the quality properties of different new proteins such as their functionality. Different case studies are possible. As alternative sources of plant proteins both soy and pea are relevant. Both crops with a potential to be grown in Belgium are gaining more interest. In the Plant Sciences Unit of ILVO several projects are running or will be started up to discover the potential of the growth of these crops in the region of Flanders. The next step will be the evaluation of possible applications of these locally grown crops and their extracted proteins in food or feed applications. Finally, there's an increasing interest into (micro)algae and microbes as potential feedstock for the extraction of proteins. Besides studying the impact of the processing steps on functionality of the proteins, the expertise and infrastructure is available to study impact on nutritional value, organoleptic quality, allergenicity, digestibility, … which are all relevant in the context of process and product development to realize protein diversification and its implementation in a healthy and balanced diet.

***Metabolomics**, **metagenomics**, **proteomics, bio-informatics and systems biology in the context of food- health research**. A new research line has started on the relation between food and health. This applies on production animals as well as on humans. Animals can be used as human model organisms; ILVO has recently acquired mini-pigs for this purpose. Several influencing factors can be investigated such as composition of the diet, alternatives for antibiotics, pro- and prebiotics, nutraceuticals. Analytical approaches such as gut bacterial metagenomics, metabolomics, proteomics, gut physiology and intestinal morphology will be used. Untargeted metabolomics using high resolution mass spectrometry (HRMS) is one of the analytical goals to identify marker metabolites (e.g. biogenic amines) in food and the gut. A thorough bio-informatics and systems biology approach will be needed to link and interpret the multitude of multidisciplinary data for which experienced researchers are invited to join this research line.

***Untargeted food analyses with MALDI-TOF mass spectrometric and InfraRed spectroscopic techniques .**

Untargeted food analyses is an emerging discipline which can be used for quality, safety or authenticity control of food processes or products as on-line or at-line applications. It is based on database building and recognition of patterns of the (bio)chemical composition or physico-chemical properties of food products. Suitable analytical techniques which enable fast pattern acquisition are MALDI-TOF (positive and negative ionization mode) and infrared spectroscopic techniques such as NR-IR and FT-IR. It is the aim to build large databases of properties and characteristics of specified food products and perform pattern recognition with the aid of artificial intelligence which can be in the form of machine learning. ILVO has the necessary analytical infrastructure and expertise in artificial intelligence to start with this new untargeted platform of food analyses.

Plant Sciences

Contact persons: Isabel Roldan; isabel.roldan-ruiz@ilvo.vlaanderen.be

Johan Van Huylenbroeck; johan.vanhuylenbroeck@ilvo.vlaanderen.be

***Genomic selection of yield and yield components in European soybean**
Soybean is an important grain legume and an excellent source of protein. It holds great potential to increase the EU's protein self-sufficiency, but requires the availability of soybean varieties adapted to European pedoclimatic conditions. Soybean exhibits sensitivity to photoperiod and is a short-day plant, what limits its natural geographical distribution to a narrow latitudinal range. To facilitate breeding of soybean adapted to Europe, the project aims at gaining insight into the genetic control of yield and related traits : yield components, phenology related traits and process-based parameters with physiological meaning obtained through crop modelling approaches. We make use of unique phenotypic and genotypic datasets generated in the context of the EU project EUCLEG, complemented with genotypic information for specific traits, and implement Genome-Wide Association Studies and genomic prediction to explore thoroughly the potential of genomic selection in soybean breeding for Europe.

***Precision crop phenotyping.** Precision phenotyping is very relevant in the context of plant breeding. ILVO develops dedicated plant phenotyping tools based on the capture and analysis of images obtained under controlled environments, in the greenhouse or in the field. In the field we use drones that can be equipped with different cameras (visual, NIR, thermal, hyperspectral). We have phenotyping experience with different crops, including forage grasses, maize, wheat or soybean. In the context of these activities, ILVO is partner of the Belgian plant phenotyping node.

***Functional-Structural Plant Modelling.** Functional-Structural Plant models (FSPM) are mathematical descriptions of plants, in which ecophysiology is merged with plant architecture. As such, virtual three-dimensional plant models are generated and used to perform *in silico* experiments. These models are innovative tools for studying competition (e.g. crops with weeds) and mutualism (e.g. agroforestry) between species. Furthermore, FSPMs are used to design ideal theoretical phenotypes for specific climatic/geographical areas, or specific growing systems, assisting breeders to select and cross plants with interesting beneficial traits.

***Pollen metabarcoding.** Next generation sequencing (NGS) and more specifically amplicon sequencing can be used to investigate the taxonomic composition of complex samples. Based on the sequence variants present in the pool of amplicons, the taxonomic composition is determined. At ILVO, we have both wet-lab (library preparation) and dry-lab (bioinformatics) experience with molecular barcodes corresponding to different groups of organisms, such as bacteria (16S), fungi (ITS2), nematodes (18S). We have the ambition to extend our molecular toolbox with protocols for pollen metabarcoding using one or more barcodes suited for plants, for example *rbc*L, *mat*K or ITS. These protocols can be used to investigate pollination networks and plant-pollinator interactions, aspects of particular relevance for optimizing the seed yield of insect-pollinated crops.

***Exploring genetic diversity in breeding genepools**. In an integrated approach, we develop strategies that combine functional gene annotation and candidate gene selection for agronomical relevant traits. For instance, pathways that control plant architecture (related to

yield), or secondary metabolite biosynthesis (related to quality). We then design highly efficient Next Generation Sequencing (NGS) based genotyping assays to screen for genetic diversity in breeding germplasm, and combine this with bioinformatics approaches to predict the functional consequences of DNA-polymorphisms. This approach to identify naturally occurring genetic polymorphisms is complemented with the development of highly multiplex CRISPR-Cas genome editing techniques for the targeted introduction of sequence variants in multiple genes of the same pathway or multiple members of a given gene family. Combined, these techniques allow to identify or create elite breeding materials.

***Unravelling plant behavior using machine learning.** Grasslands cover a large part of the agricultural and natural area, and are therefore agronomical and ecologically of substantial importance. In the face of Climate Change, it is essential to understand the behavior of grasses in response to the environment in which they grow to safeguard the diversity they harbor and the ecosystem and economic services that they deliver. ILVO has completed several projects with multi-location field experiments in which large sets of phenotypic and genomic data have been generated. We use machine learning techniques to explore patterns in the reaction of plants to their environment, and develop predictive models of their response to future climatic conditions. These machine learning models are used to study the effect of Climate Change on grassland adaptation at the genotype and phenotype level, and assist breeders in the selection of plants with the highest potential.

***In vitro regeneration of (recalcitrant) protoplasts**. ILVO- Plant Science Unit has gained experience in protoplast regeneration in various crops. Regeneration is very species dependent and the process has been thoroughly monitored, however without in-depth understanding of its molecular and physiological backgrounds. Comparing regenerative and non-regenerative circumstances for particular genotypes will provide more insight. The effects of culture system, phytohormone addition, medium refreshment…will be evaluated. More precisely, we want to study phytohormone metabolism with an array of chromatographic tools, evaluate genome silencing and DNA condensation with molecular and microscopic tools and link these to particular regeneration events (first divisions, callus formation, organogenesis…). Subsequently the effect of significant parameters will be tested on non-regenerative genotypes.

Mass spectrometric analysis for plant (a)biotic stress hormone profiling using *LC-MS/MS and LC-HRMS methods. Within ILVO-Plant Sciences Unit breeding involves the evaluation of stresses in plants. Plant hormone analysis by MS is available for different stress related hormones such as salicylic acid, jasmonic acid, abscisic acid, etc. The goal is to reveal relationships between plant developmental stages, genotype, etc. and plant hormone regulated stress responses. Stresses involve drought, insects, mites and pathogens.

***Ornamental plant breeding.** ILVO-Plant Sciences Unit has ongoing breeding programmes in azalea, nursery plants and garden roses in close collaboration with growers. Therefore different techniques are used linked to (interspecific) hybridisation and to overcome pre- and postzygotic incompatibilities: embryo rescue, genomic and fluorescent in situ hybridisation (GISH and FISH), molecular markers, ploidy and genome size estimation, fertility testing, etc. Specific breeding goals we focus on are new innovative genotypes, scent, disease resistance, compact plants, etc. Research can be performed on a specific crop for a specific breeding goal using different techniques.

Animal Sciences

Contact person: Sam De Campeneere; sam.decampeneere@ilvo.vlaanderen.be

***Untargeted proteomics in animal production**

Untargeted-OMICS research is an analytical approach in which the whole of components belonging to a certain class (e.g. metabolites, proteins, sugars, fats, ...) are profiled and in which interesting components can be further identified. This is in contrast to targeted analysis, where certain components are selected in advance for analysis. The major advantage of the untargeted -OMICS approach is that it provides a much broader view of what is present and what is happening in a particular biological process, potentially leading to the discovery of biomarkers for biological mechanisms. In recent years, ILVO has invested in the appropriate equipment (High Resolution Mass Spectrometry (HR-MS)) and starts to implement the technology in research projects on livestock farming.

One research topic in which untargeted metabolomics can be of added value is the investigation of factors that influence **colostrum quality**. Ruminants have a synepitheliochorous placenta which prevents the transfer of antibodies from the mother to the foetus. As a result, calves are born without antibodies and are entirely dependent on immunoglubulins (Ig) taken from colostrum just after birth to build up their passive immunity. Although every farmer is aware of the importance of colostrum for the health and development of the calf, it appears that not all calves take up enough Ig's from colostrum, resulting in a higher risk of illness and mortality. This phenomenon is also known as **'failure of passive transfer'** and can partly be explained by the fact that colostrum does not always contain the same amount of Ig's, but also because the calf does not always absorb them efficiently.

In an ongoing project, we search for an explanation why calves do not always succeed in absorbing sufficient Ig's from colostrum. We look beyond the known influencing factors such as time of milking and colostrum supply. Colostrum naturally contains a **microflora** and this microflora is partly responsible for the first microbial colonisation of the calf's intestine and hence plays a role in gut health and immunity. In addition, colostrum is very rich in **microRNAs**, which are encapsulated in microvesicles so that they are not broken down in the abomasum and can be absorbed in the calf's intestine. As a result of this project, ILVO has an extensive database of more than 100 colostrum samples that are currently characterized for their microbial and microRNA composition. **Untargeted proteomics and metabolomics** on these colostrum samples can be a very valuable addition to the microbiome and miRNome data. In addition, untargeted omics of blood and fecal samples from the newborn calf may enhance the understanding of the influence of colostrum composition on calves **gut health and immunity** and may clarify the complex relationship between the host and his microbiome. Research into hitherto unknown bioactive components in colostrum is not only very valuable for cattle farmers or producers of colostrum substitutes and milk powders, but there is also interest from the human medical sector and food industry.

Welfare & behaviour of farmed and harvested animals. ILVO animal science unit has state-of-the-art facilities and long-standing expertise for conducting research on assessing, monitoring and improving the welfare of poultry, pigs, cattle, other farmed animals such as fish, and commercially harvested marine species. These facilities include behavioural surveillance hard- & software, sensor technologies (such as automated real-time UWB position tracking; cameras for computer-vision based species identification and condition assessments), experimental herds (cattle, poultry and pigs), and tank-farm facilities.

Our expertise and research includes all stages of the production chain, including early-life conditions, production phase, depopulation, transport, slaughter and harvest. Interested post-doc researchers are welcome to contact the research group for suggestions of research topics or for discussing their own research proposals as long as they contribute to a better understanding of the behavior and/or to a better quality of life of farmed animals.
Contact: Frank Tuyttens (frank.tuyttens@ilvo.vlaanderen.be)

***Youngstock feeding and management.** ILVO is running several trials with dairy (Holstein) and beef (Belgian white & blue) young stock on colostrum management & feeding management. Especially of interest are the impact of feeding and management strategies on growth performance, rumen development, rumen and intestine microbiome development and function, feed efficiency. Our research and collaboration with e.g. Ghent University, University of Liège combines specialties of feed, feed evaluation, performance trials and in depth microbiome analyses techniques. Besides trials in our specialized animal facilities, we also work closely together with Flemish dairy and beef farms to translate interesting findings to the sector. Interested post-doc researchers are welcome to perform synergetic research activities in the area of microbiome development and evolution, rumen physiologic research and/or immunological research in cattle young stock.

***Non-invasive monitoring of nitrogen excretion and efficiency in cattle.** ILVO animal science unit has a long track record on feeding trials, feed evaluation and nitrogen balance trials. We are well equipped in these research area with up to data dairy cattle production facilities, several single and few double cannulated cows within our herd to perform in sacco feed evaluation trials. Recent research is oriented towards low protein diets both in dairy and beef in order to work on ammonia emission reduction in a source oriented way. Within the different feeding and nitrogen balance trials, we have collected a elaborative set of feed, milk, urine and feces samples. Interested post-docs could develop a non-invasive or limited invasive ready to use monitoring system for nitrogen excretion, ammonia emission and nitrogen efficiency based on milk, saliva, blood and/or spot urine samples.

***Livestock emissions on animal level.** ILVO animal science unit has an experience of almost a decade to measure greenhouse emissions of individual animals. The facility contains open circuit chambers and different onsite gas emission analyzers including GreenFeeds. This makes measurement possible in our research barn and at animal farms. Our research and collaboration efforts aim to investigate the effect of different diets and additives on the production of greenhouse gases by the targeted animals. Most research is done on dairy cows and methane since they are the major emitters and with the most impact in animal agriculture. Interested post-doc researchers test new or promising diets and additives to mitigate on-farm methane emissions.

***Increase the taste and quality of the Flemish pork**

Future Flemish Pig is a research project that aims to combine innovations in genetics, animal nutrition, slaughter and processing in Piétrain crossbred fattening pigs. Moreover, through a multidisciplinary research approach, insights are sought that may contribute to the role of fattening pigs in circular agro-food systems in the longer term. By implementing data sharing via innovative blockchain technology, not only the developed strategies to improve animal welfare, efficiency in breeding or slaughtering processes but also quality aspects of taste or food safety in both meat portions or dried hams can contribute to increased transparency not only for the pork chain players involved but also for the end consumers.

The work plan aims to 1/ develop strategies that improve animal welfare, 2/ reduce losses both at the animal (pre-slaughter) and carcass (post-slaughter) level, 3/ improve the taste and quality of fresh pork and dry-cured ham to a level perceptible by the consumer, 4/ obtain new insights into the resilience of fattening pigs with a Piétrain sire to major feed fluctuations, especially if this feed is mainly composed of variable and fibre-rich co-products, 4/ to obtain new insights into the resilience of fattening pigs sired by Piétrain to major fluctuations in feed, especially if that feed is primarily composed of variable and fibre-rich side stream ingredients (feed resilience), 5/ to unlock the potential of blockchain technology in the pig production and processing chain based on improved transparency and automated traceability.

***Extended production cycle in laying hens**

Laying hens are kept in production until the age of 75-80 week, but the actual egg production period is only 55-60 weeks long. During a single laying cycle a hen can produce on average 360 eggs. Extending the egg production period and keeping hens longer, possibly until 100 week of age would not only contribute to increased profitability but also to more sustainable food production. However, there are several bottlenecks in extending the production period of laying hens such as declining persistency and egg quality, decreased bone quality, health and welfare. To tackle these problems, a multifactorial approach is needed. Improved genetic selection has to be accompanied by optimal nutrition and management to be able to produce 500 eggs until 100 week of age which should be feasible by 2020, as layer breeding companies predict. ILVO has the equipment and expertise to carry out layer performance trials, digestibility trials, determination of egg quality and body composition to get better insights in these questions.

***To reduce emissions from the poultry industry**

For the poultry industry, concerns about emissions such as ammonia, odor and dust are multifaceted and include issues of poultry performance, health, and welfare, and environmental impact. Pressure is being placed on poultry producers to reduce their emissions but at the moment they are lacking efficient and affordable solutions. Research is needed to improve or develop methods of new techniques in poultry husbandry management or concerning adaptations in nutrition to reduce the poultry emissions. Environmental pressure is an important scientific topic within ILVO that has the expertise as well as the equipment for investigating emission reducing strategies.

***Alternative protein sources for the poultry industry**

In the last years more attention is being put on the use of local feed resources, particularly for protein sources, both for broilers and laying hens. The feed industry and by-product industry is active in this topic and several alternatives to soya have appeared in the last 10 years: macro and micro algae, new by-products from the rapeseed and sunflower processing industry, legumes (peas, faba beans, etc) , insects, single cell protein production from bacteria and/or yeasts and extraction of protein from grass and other green crops. However, there is still information lacking and research is needed on how poultry react to these protein sources in terms of performance, health and welfare. ILVO has the expertise and the facilities to carry on scientific research that evaluates the impact of new feedstuffs and protein sources on animal digestive physiology, health and performance.

Marine Sciences

General contact for marine sciences: Hans Polet (hans.polet@ilvo.vlaanderen.be)

Application of Hyperspectral Cameras in Quality Assessment of Catches

The use of hyperspectral cameras in assessing catch quality on commercial fishing vessels offers significant advantages over traditional methods. These cameras capture detailed spectral information across a wide range of wavelengths, allowing for the identification and analysis of subtle variations in fish composition. By analysing spectral signatures of different components (e.g., skin), hyperspectral cameras accurately assess attributes like freshness, texture, colour, and contaminants. They provide objective and quantitative measurements, processed with advanced algorithms and machine learning, enabling real-time analysis and immediate feedback to fishermen and processors. Hyperspectral cameras enhance operational efficiency, minimize waste, and optimize value throughout the supply chain. They also contribute to data-driven fisheries management by collecting large-scale spectral data to identify patterns and trends in catch quality. Collaborative efforts are underway to harness the full potential of hyperspectral imaging technology, creating opportunities for researchers and industry professionals to contribute to innovation in this field. Ultimately, integrating hyperspectral cameras improves catch quality assessment, supports sustainable fishing practices, and delivers high-quality products to consumers.

*Application of Artificial Intelligence in age reading of fish

Age determination of fish otoliths is fundamental to evaluate stock status as age data underpins growth and mortality rates, maturity patterns and eventually stock size. It is key information in achieving sustainable exploitation. Therefore, routine ageing is conducted in age reading laboratories across the globe with the aim to deliver age data for stock assessment purposes. However, extracting age data from otolith images is labor-intensive and accuracy of the age reading is very dependent on the experience of the age readers. Hence, a cost-efficient and accurate method for age determination urges itself. The rapid development of artificial intelligence offers opportunities to develop a method for automatic prediction of ages based on otolith images. Several international initiatives are currently running within this research field, enabling interested post-doc researchers to perform valuable synergetic activities.

Social Sciences Unit

Contact persons: Elke Rogge; elke.rogge@ilvo.vlaanderen.be

Fleur Marchand; fleur.marchand@ilvo.vlaanderen.be

Participatory farm modelling. ILVO has a research line focusing on the participatory development of farm models that support on-farm decision making. In order to facilitate adoption of these models in practice, stakeholders are involved in the development process from the very beginning onwards. They help in defining the system and system boundaries to be modelled, and contribute to incorporating tacit knowledge from practice into the models. Models are developed for different agricultural sectors (pig, dairy, etc.) and are transformed into user-friendly decision support tools. Besides analyzing participatory model development as a process, an important focus of the research lies in analyzing the interplay between strategic 'long term' decisions and operational 'short term' decision making, and dealing with this interplay in modelling efforts.

Participatory GIS for open space management. Open space is under pressure due to the increasing population density and processes of urbanisation and counter-urbanisation. Remaining open space is scarce and the subject of debate. Various functions such as nature development, residential development, recreation, food production, flood protection,… compete and claim the same valuable pieces of land. Both rural, urban and peri-urban communities are faced with the question of how to deal with these competing claims and how to preserve/manage open space in a context of urbanisation. Specifically in the context of climate change, these issues will become even more prominent, as open space is a crucial asset for climate adaptation. Within this research line we explore the potential of using participatory GIS as a tool to stimulate this dialogue and envisioning processes within resourceful community management of open space. Participatory GIS is a methodology that can be applied to reveal stakeholder's values for specific places (often referred to as "public participation GIS") or to gather (spatially explicit) tacit knowledge from stakeholders (referred to as "participatory mapping"). Moreover, it can be applied to support multi-actor discussions and problem solving processes in spatial planning. This field of research is situated on the interface between community participation digital geospatial techniques.

General Contact:
Prof. Dr. Marc Heyndrickx
Scientific director

ILVO
Flanders research institute for agriculture, fisheries and food
Technology & Food Science Unit
Brusselsesteenweg 370
B-9090 Melle (Belgium)
T +32 9 272 30 44 **M** +32 478 317 845
marc.heyndrickx@ilvo.vlaanderen.be
www.ilvo.vlaanderen.be
www.foodpilot.be

More info about our services concerning food-related analyses see here
ISO 14001 environmentally certified for BELAC accredited analyses (TEST 033 and PT 033)

//